A Mixed-Method Study of How Instructors Design for Learning in Online and Distance Education

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A mixed-method study into how instructors design for learning in online and distance education

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Abstract

The use of analytical methods from learning analytics research combined with visualisations of learning activities using learning design tools and frameworks has provided important insights into how instructors design for learning. Nonetheless, there are many subtle nuances in instructors' design decisions that might not be easily be captured using learning analytics tools. Therefore, this study sets out to explore how and why instructors design for learning in an online and distance higher education setting by employing a mixed-method approach, which combined semi-structured interviews of 12 instructors with network analyses of their learning designs. Our findings uncovered several underlying factors that influenced how instructors designed their modules, and highlighted some discrepancies between instructors' pedagogical beliefs and their actual learning design as captured by OULDI. This study showcased the potential of combining learning analytics with qualitative insights for a better understanding of the complex design process in online distance higher education.

Notes for Practice (research paper)

- Learning analytics has provided tools and methods to understand how instructors design for learning
- The learning design process was strongly influenced by institutional policies and management
- Study skills, workload, and subject disciplines are important factors in designing online courses
- Co-designing and re-designing are prominent in the learning design process of online education
- A mixed-method approach can provide an in-depth understanding of how and why instructors design their courses for online and distance education

Keywords

Learning design, learning analytics, mixed method.

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1. Introduction

Teaching entails delivering information, planning and designing learning activities, resources, and technologies to help students achieve their goals (Goodyear, 2015; Persico, Pozzi, & Goodyear, 2018). However, often there is a lack of feedback on what elements of a learning design work, for whom, and in which circumstances. Two strands of research in education have emerged that can help educators gain better insights into the teaching and learning process. Learning design, is defined as "*a descriptive framework for teaching and learning activities ("educational notation"), and to explore how this framework can assist educators to share and adopt great teaching ideas*." (Dalziel et al., 2016, p.4). Research in LD has developed a wide range of tools and frameworks to document and visualise sequences of learning activities designed by instructors and to guide them through the LD process (AUTCLearningDesign, 2002; Cross, Galley, Brasher, & Weller, 2012; Hernández-Leo et al., 2018; Koper & Manderveld, 2004; Laurillard, Kennedy, Charlton, Wild, & Dimakopoulos, 2018). Through the transition from implicit to explicit representations of LD, instructors can reflect on their practices, while re-using and adapting good instructional approaches from others.

In parallel to LD, LA has emerged as a field in this decade since the first Learning Analytics Knowledge (LAK) conference in 2011. Learning analytics is defined as "*the measurement, collection, analysis and reporting of data about students and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs*" (Ferguson, 2012, p.305). LA research typically collects a large amount of data about students such as demographics, course performance, activity logs of students (Macfadyen & Dawson, 2010), discussion forums interactions (Wise, Cui, Jin, & Vytasek, 2017), and open texts from essays or course evaluations (Ullmann, 2019). By taking advantage of advanced analytical techniques such as machine learning (Ullmann, 2019), text-mining , and social network analysis (Wise et al., 2017), LA has created practical applications to support the learning process.

Although LA and LD had different origins, there exists a strong synergy between the two fields, which was acknowledged at the first LAK conference (Lockyer & Dawson, 2011) and in subsequent discussions (Bakharia et al., 2016; Griffiths, 2017; Mangaroska & Giannakos, 2018; Mor, Ferguson, & Wasson, 2015; Persico & Pozzi, 2015). On the one hand, LA provides data and tools to test pedagogical assumptions in LD against actual student interactions. On the other hand, LD provides the necessary contextual overlay to better understand observed student behaviour and to translate LA findings into actionable insights (Lockyer & Dawson, 2011). Prior empirical works have shown the benefits of embedding LD in LA, such as improving predictive accuracy of academic performance (Gašević, Dawson, Rogers, & Gasevic, 2016), understanding the impact of LD on student engagement, satisfaction, and performance (Rienties & Toetenel, 2016), and exploring the navigation sequence of learning activities (Ifenthaler, Gibson, & Dobozy, 2018).

A large number of LD tools and frameworks has been developed over the years to capture and describe sequences of learning activities. Early examples are Educational Language Modelling (EML) (Koper & Manderveld, 2004), and the Learning Activity Management System (LAMS) (Dalziel, 2003), while more recent ones include Learning Design Studio (Law, Li, Herrera, Chan, & Pong, 2017), Learning Designer (Laurillard et al., 2018), the Integrated Learning Design Environment (ILDE) (Hernández-Leo et al., 2018), and the Open University Learning Design Initiative (OULDI) (Conole, 2012) Previous work reported that LD tools were positively perceived by instructors in facilitating new teaching ideas (Laurillard et al., 2018; Toetenel & Rienties, 2016a), supporting a collaborative design process among practitioners (Hernández-Leo et al., 2018), and making the LD process more systematic (Dalziel, 2003; Koper & Manderveld, 2004). While prior research has provided important evaluations of LD tools from a user-experience perspective, only a few studies have explored how instructors in practice design courses on a large scale (Rienties, Toetenel, & Bryan, 2015; Toetenel & Rienties, 2016b).

For example, using OULDI Toetenel and Rienties (2016b) analysed 157 LD visualisations at the Open University (OU) and found that the majority of modules used assimilative activities (i.e., readings, watching, listening) and assessment (i.e., assignments, exams) activities. On average, assimilative and assessment activities accounted for 39.27% and 21.50% of the total workload respectively. Rienties et al. (2015) identified four patterns of LD amongst 87 modules, which they labelled constructivist, assessment-driven, balanced-variety, and social-constructivist. While these studies provided important insights into our understanding of LD, they did not explore how LD changes throughout the length of a course. For example, instructors use a wide range of learning activities varying from week to week or day to day throughout a course (Nguyen, Huptych, & Rienties, 2018). The order and sequence of how learning activities are structured will potentially influence the effectiveness of the learning process. Therefore, the first research question of this study will address the gap in our understanding of how instructors design for learning in distance education through the use of learning analytics.

RQ1: What does learning analytics tell us about the learning design in online and distance higher education?

Although the documentation and visualisation of LD can make instructors' pedagogical decisions more explicit, there are many factors behind the scene may not be visible to LD tools such as OULDI. These include pedagogical beliefs, personal experience, composition of the student body, and "politics" within institutions. Extensive research in the field has shown that LD is a multifaceted process which involves multiple stakeholders with different factors interacting in the process of designing and implementing teaching and learning activities. For instance, Bennett, Agostinho, and Lockyer (2015) conducted 30 interviews across 16 Australian universities to explore key influences that shape university instructors' design decisions. The authors identified student-related factors (e.g., cohort profile, learning objectives, feedback from past sessions), instructors-related factors (e.g., prior experience, pedagogical beliefs, self-belief), and context-related factors (e.g., colleges, institutional requirements, resources) that influenced how instructors engaged in the design process (Bennett et al., 2015). Therefore, the second research question will explore the underlying factors that influence instructors' LD processes.

RQ2: What are the driving factors behind instructors' learning design in online and distance higher education?

2. Methods

Study context
This mixed-method study took place at the Open University, the largest academic institution in the UK and in Europe with 117,935 enrolled students in 2017/18[1]. As a pioneer in distance learning model since 1969, the OU offers more than 200 qualifications and 400 modules via a distance learning model, which involves the use of a Virutal Learning Environement (VLE) in conjunction with online and/or face-to-face tutorials with designated tutors.

To answer RQ1, we applied a well-known learning analytics technique, namely network analysis, to analyze the composition of learning activities within learning designs, the frequency of the activities and the links between them (Nguyen, Rienties, & Toetenel, 2017). Network analysis has been widely used to infer the social interactions between students, such as in online discussion forums (Wise et al., 2017). As argued by Nguyen et al. (2017), a learning design can be viewed as a network of learning activities, resources, and tools in which instructors made deliberate choices to intertwine different components to design for optimal learning experience. However, these network structures are implicitly embedded in the course syllabus and/or weekly lesson plans. In order to incorporating LD into LA models, we need an explicit and quantifiable representation and a standardized taxonomy of learning activities that would allow for multi-course comparison.

RQ1 Linking learning analytics with Learning design representations
At the OU, each new module goes through the OULDI mapping process, which maps out all learning activities and their estimated time to complete the activities. The learning activities are categorised based on the OULDI learning activity taxonomy originally developed by Conole (2012), which consists of seven types of learning activity: assimilative, productive, assessment, communication, finding and handling information, interactive, and experiential. OULDI has subsequently been further fine-tuned and adjusted over time based upon both practical experiences as well as LD research (Toetenel & Rienties, 2016a). Data were collected from the OULDI Activity Profile tool (Figure 1) which was designed to help instructors map different types of learning activity across a course or sequence of learning events (Toetenel & Rienties, 2016a).

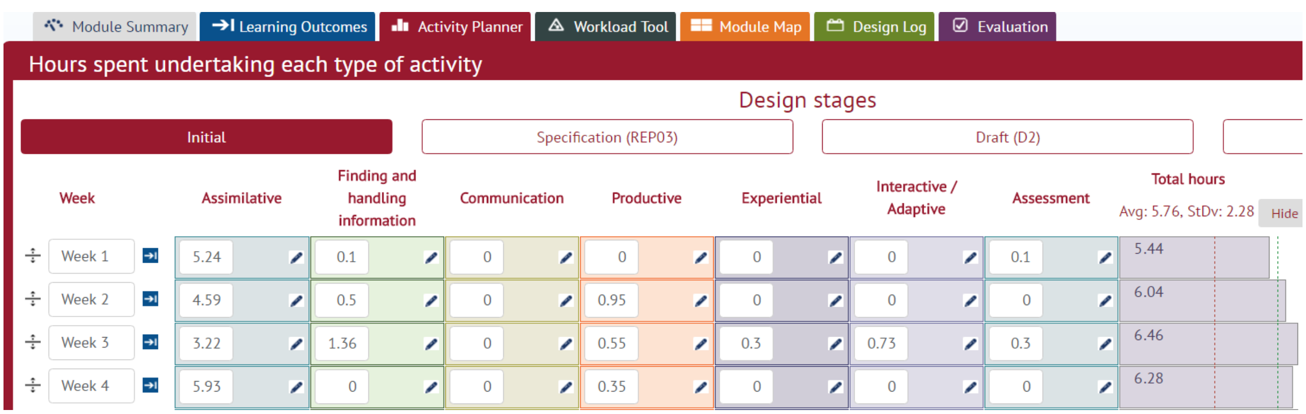


Figure 1. A screenshot from the OU Activity Profile at www.learning-design.open.ac.uk

Assimilative activities refer to tasks which require student's attention to information. These include watching lecture video, reading the text, listening to an audio file, etc. *Finding and handling information* activities implies, for example, searching and filtering for relevant literature in a particular topic on the internet. *Communication* activities refer to a range of practices to communicate such as posting in a discussion forum and replying to peer comments. *Productive* activities represent the construction of an artefact, such as writing a summary or resolving a problem. *Experiential* activities provide students with opportunities to apply theories in a real-world setting such as case study, or field trip. *Interactive/adaptive* activities encourage students to apply what they learned in an experiential environment or interacting with a simulation. Finally, *assessment* activities evaluate the student's understanding such as writing through the construction of an essay, exam or making a presentation (Conole, 2012). For each learning activity, an estimation is made for how long it would take an

[1] https://www.hesa.ac.uk/news/17-01-2019/sb252-higher-education-student-statistics/location

average student to complete that activity. This estimation is usually determined by the module team and being embedded in the module guide on the VLE as a guidance for students' study time allocation.

Network analysis

Building on previous work (Nguyen, Rienties, & Toetenel, 2017), we investigate the connections between the seven types of OULDI learning activities. The LD dataset was a weighted two-mode network, as illustrated in Figure 2.

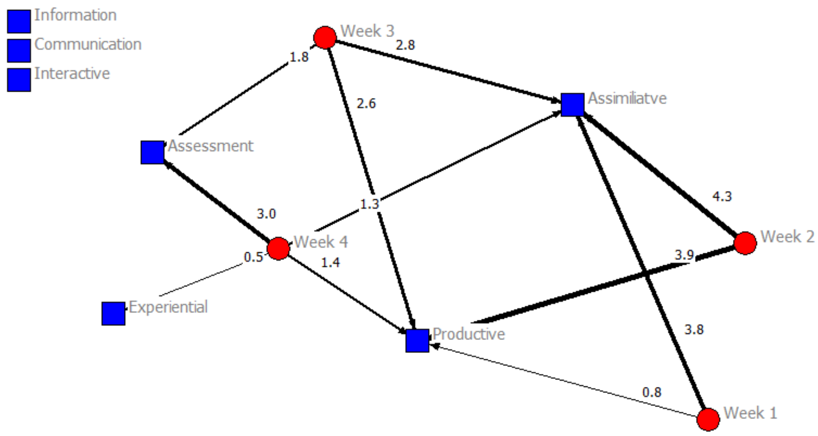


Figure 2. Two-mode network of learning activities over time

Firstly, two learning activities (blue nodes) become connected if they were present in the same week (red nodes). For example, if instructors used assimilative activities (e.g., readings) and productive activities in week 1, then assimilative and productive activities become connected (Figure 3).

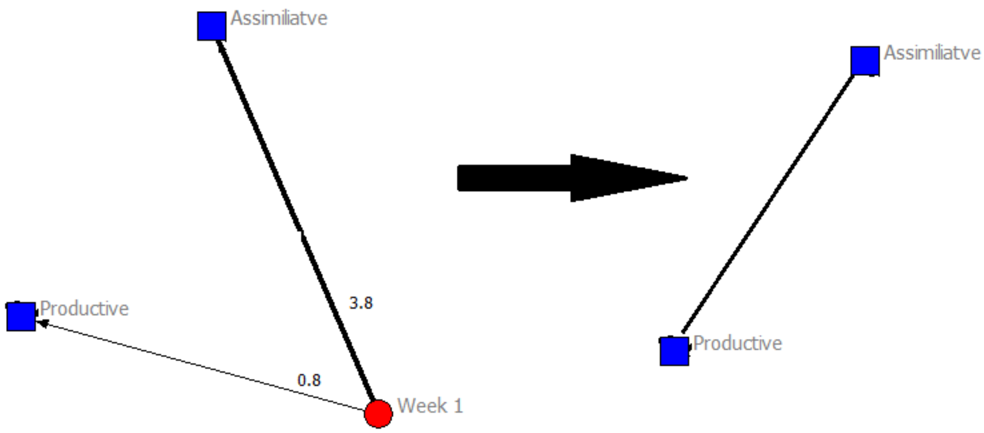


Figure 3. Transformation of a two-mode network into a one-mode network

However, simply visualising the connection between two activity types does not tell us much about the strength of the relationship. For example, module A with 5 hours of assimilative and 1 hour of productive activities will might look the same as module B with 1 hour of assimilative and 1 hour of productive. Since we captured how much time students were expected to spend on each LD each week, the weights of the two learning activities had directed towards identical weeks could also be measured. In this type of projected network, the weight of a tie from one LD to another was not necessarily equal to the weight of the reverse. For example, in Figure 3, if 3.8 hours were spent on assimilative activities and 0.8 were spent on assessment activities in the same week, then the weight from assimilative to assessment is recorded as 3.8 and the weight of the reverse is recorded as 0.8.

Second, the weight of each tie was discounted for the number of learning activity types in the same week (Newman, 2001). It can be argued that the tie between the two activity types becomes weaker when there are more activity types that are present in the same week. A simple analogy is the connection between two people is stronger there are fewer people in their group. This can be generalised as follows:

$$w_{ij} = \sum\nolimits_{p} \frac{w_i p}{N_p - 1}$$

where w_{ij} is the weight between LD i and LD j, and N_p is the number of learning activities in week p.

After transforming the dataset from two-mode to one-mode network, we used the Netdraw function of UCINET 6.627 (Borgatti, Everett, & Freeman, 2002), which is based on non-metric multidimensional scaling (Kruskal, 1964), to visualise the co-occurrences between each pair of learning activities across all weeks. The nodes represent different learning activity types. The tie represents the co-occurrence of two learning activity types in the same week. The thicker the line, the larger the weights of the tie between two learning activity types.

RQ2 Unpacking learning design decisions by interviews with instructors

To complement the quantitative exploration of learning design through network analysis, we carried out a series of semi-structured interviews with instructors to understand the underlying factors that could affect their design decisions in line with Bennett et al. (2015) (RQ2). Designing a module at the OU requires participation from multiple stakeholders (i.e., a production team) with several stages/checking points during the design process to ensure the consistency and quality of the module produced. Module chairs are responsible for making key design decisions, leading the production team and overseeing the module in its production phase and in presentation (i.e., when the module was running). Therefore, module chairs were selected as the participants in this study because they are in a good position to offer valuable insights into the LD process.

In line with Creswell and Poth (2017), we continued to sample instructors until we reached a point of saturation, whereby limited new insights were added when new participants were added. There were twelve interviews in total taking place in ten level 1 (i.e., first year undergraduate) modules across a wide range of disciplines. Table 1 gives descriptive information about the modules selected in this study.

Table 1. Selected modules for interviews (in order of size of enrollments)

Module	Enrolments**	Launched since	Credits
Language	200	2017J	30
Computing 2	700	2017J	30
Arts 1	1400	2015J	60
Science	1400	2017J	60
Health*	1700	2015J	60
Computing 1	2400	2018D	30
Arts 2	2600	2015J	60
Business	2600	2015J	60
Education*	4000	2014J	60
Psychology	4900	2015J	60

* Two interviews, one for each module chair

** Number of students at 25% fee liability date in 2018 Fall semester, figures were rounded to the nearest 100 for anonymization purposes

All interviews were audio-recorded using a recording device with explicit verbal permission from the participant. Interviews took place on the OU campus in a meeting room, except for two interviews taking place via Skype. Each interview lasted 45 minutes on average. The format of the interviews was semi-structured because it allows for key topics related to the research questions to be discussed while providing flexibility for unexpected themes to emerge from the interviews at the same time (Braun & Clarke, 2012). Since LD in the OU context is a complicated process, the flexibility of semi-structured interview format was deemed to be more suitable for unpacking nuances in module chairs' beliefs and experience in engaging with the LD process.

Thematic analysis

Thematic analysis was used to analyse the interview data to identify emerging themes of discussion that arose from the broad semi-structured interview questions (Braun & Clarke, 2012). First, we transcribed two audio recordings in order to gain familiarity with the data and used a transcription service for the rest. Next, the first author re-read the interview transcripts and revisited the audio recordings to immerse with the data while simultaneously making notes. After that, all interview transcripts were imported into NVivo 11 to begin the systematic analysis of the data through coding. During this stage, a list of 98 codes was generated. In the third phase, initial codes were revised, modified, and merged together if necessary. Emerging themes were identified by reviewing coded data for areas of similarity and overlap between codes. Themes should be distinctive but also need to work together as a coherent and compelling narrative to answer each RQ. This is an active process that combined both a *deductive* approach based on the LD conceptual framework by Dalziel (2015) and an *inductive* approach was used for generating themes. As a result, there were five themes emerged (Table 2). At this point, themes and codes were given explicit definitions in a codebook, which served as a guide map for the coding process.

Table 2. Summary and definition of the interview codes

Code	Definition of code
Institutional factors	institutional policies and management decisions influence the learning design process of instructors
Study skills	instructors embedded study skills in their learning design
Student workload	instructors considered student workload in their learning design
Redesign/Codesign	the learning design was based on existing materials/modules or how learning design was a collaborative effort
Pedagogy	instructors structure learning activities such as readings, case studies, collaborations, assessment

Finall, the coding scheme and the emerging themes were reviewed and discussed with the second and third author, who coded two randomly selected anonymous interviews and compared their notes. This phase is essentially about checking the consistency and quality of the codes and themes generated. Any disagreements between two coders were discussed and the coding scheme was revised accordingly. These narratives were then compared with the quantitative findings from RQ1 to draw the connections between LD representations and instructor perspectives. The combination of members checking and data triangulation with quantitative findings enhance the trustworthiness and credibility of the findings. All identifiable information was anonymised.

3. Results

3.1. What does learning analytics tell us about learning design in online and distance higher education?

The first section of the results reported LD figures of the selected modules in this study. There were missing data for four modules because they were recently launched in 2017/2018, which have not been mapped in the OULDI Activity Profile.

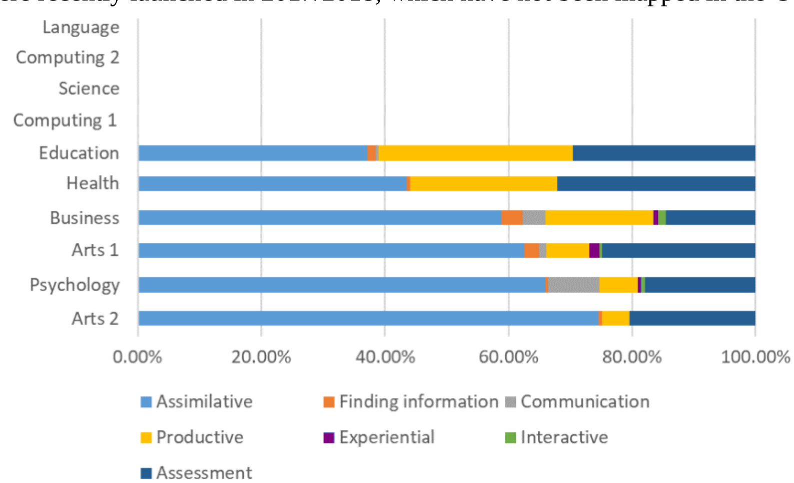
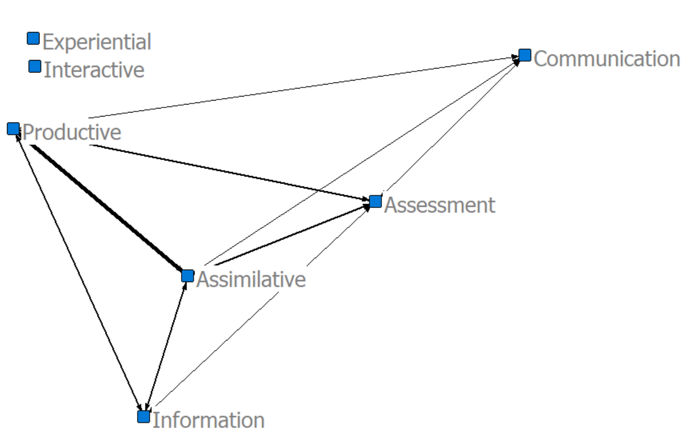


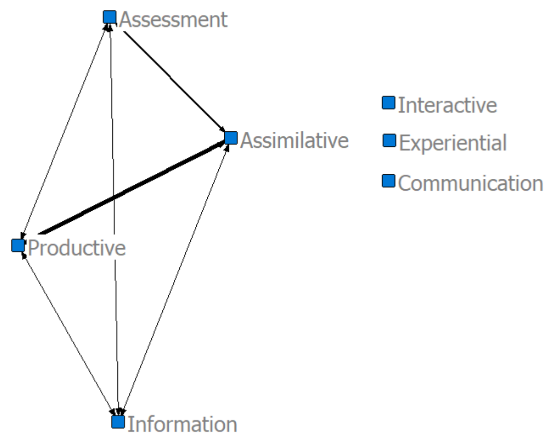
Figure 4. Learning design of 10 modules in the interviews

Note: Missing data from 4 new modules which were launched since 2017/2018

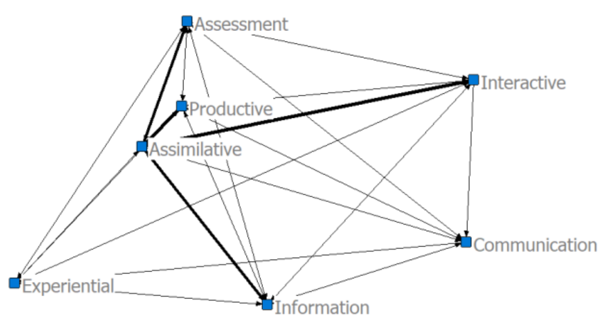
The six modules with available data in Figure 4 showed a common trend, in which assimilative activities accounted for the majority of the total workload, followed by assessment and productive activities. However, for some modules assimilative was the main activity (Arts 2, Psychology), while in others less than 50% of activities were focussed on assimilative. Communication activities were present in the Psychology, Business, and Arts 1 modules. There were little or no communication activities in the Health, Arts 2, and Education module. Interactive activities were used in the Business, Arts 1, and Psychology modules. Finding and handling information activities were used with a low frequency in all six modules.



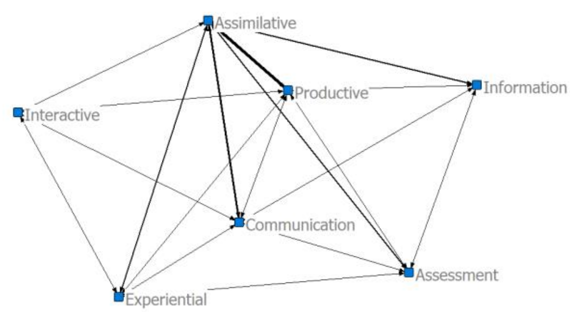
Module 1, Education (density = 0.429)



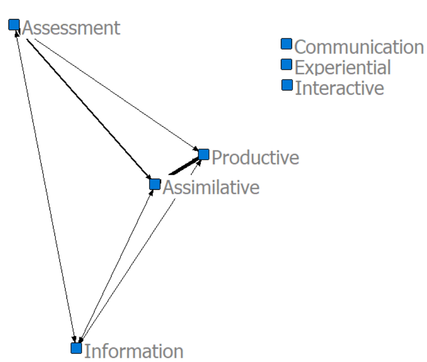
Module 2, Health (density = 0.286)



Module 4, Arts 1 (density = 0.952)



Module 5, Psychology (density = 0.857)



Module 6, Arts 2 (density = 0.286)

Figure 5. Network visualisations of five exemplary modules
Note: Module 3 in Business was not visualised because there were no data at a weekly level
Note: The weight of ties was omitted for the sake of visual clarity.

Using our learning analytics network approach, **Figure 5** visualised the network structure of learning activities in modules which have been mapped at a weekly level. Substantial differences in the underlying connections between these learning activities were found on a weekly level. For example, Module 1 in Education had a strong tie between assimilative and productive activities. However, there were weak links in communication activities and in information activities. The network density of this module was 42.9% which implied a moderate variety in learning activity types. Similarly, in Module 2 in Health there was a strong link between assimilative and productive activities. However, this module did not use any interactive, experiential, or communication activities. The network density was low (28.6%) which suggested that there was a lack of varieties in the LD. The most common repertoire of practice was assimilative and productive (10 out of 31 weeks).
In contrast, in Module 4 in Arts 1 there were strong connections between assimilative and assessment, assimilative and production, assimilative and interactive, and assimilative and information. There were weak links among other learning activity types. The network density was 95.2% which suggested that all seven types of learning activity were highly interconnected in the module.
Module 5 in Psychology had strong ties between assimilative and productive, assimilative and communicaiton, assimilative and information, as well as assimilative and experiential. This module also had a high network denisty (85.7%) which suggests that instructor in this module employed a wide range of learning activities in their design. Module 6 in Arts 2 had a strong tie between assimilative and productive but there were weak links or no connections with other activity types. The module has a low network density of 28.6% which implies that this module only used on combination of activity types in most study weeks.
In other words, our learning analytics approach using network analysis on a weekly level uncovered several complex LD strategies used in five different modules. The results indicated a strong influence of assimilative activities in workload and in relations with other learning activities. While assessment played an important role in all modules, instructors deliberately reduced workload on other learning activity types when they introduced respective assessment activities in a particular week. In other words, separate assessments were preferred over continuous assessments in most modules.

3.2. What are the driving factors behind instructors' design decisions in online and distance education

In order to get a more detailed understanding of some of these quantitative differences learning design activities as captured by the OULDI approach, RQ 2 aimed at exploring the underlying factors that influenced the respective design processes. The analysis of interview transcripts revealed five major themes.

Theme 1: Learning design process was influenced by institutional factors

A consistent theme emerging through the interviews with module chairs was the influence of management and institutional policies on the LD process. Many module chairs reported that the design process was kickstarted by decisions from management.

> *''When the head of the department comes and knocks on your door, you know that it's never good news. And so we was told that [MODULE CODE] was needed a radical remake... When you design a module, you never ever have free rein in what you do. Often the design is strongly influenced by the senior team at the beginning stages.'*
>
> *'The learning design, to a large extent, was dictated by university initiative. It had to be turned into 60 credits from two 30 credits. It was also done very quickly, as we understand it. So not having the blank sheet to start from scratch, it has never really been outcomes.'*
>
> (Participant 6, Arts 1)

The influence of management and institutional policies also restricted the autonomy of module chairs when making decisions about LD. Many participants mentioned that their LD decisions regarding assessment strategies were influenced by the recent change in institutional policy, the so-called single component assessment (SCA). The concept of SCA was first introduced in 2015 to support the OU's strategic objective to improve student retention and progression. Traditionally, OU modules included both a continuous assessment component such as tutor-marked assessments (TMAs) or computer-marked assessments (iCMAs), and an examinable component such as exams or end-of-module assessment (EMA).

> *'Originally we were told that we should have a portfolio at the end. And for TMA's and a portfolio and that this was something that was even, that was passed down from LTI (Learning & Teaching Innovation). We didn't have much say about it'*
>
> (Participant 3, Education)
>
> *'It was going to be one or the other, and modules would end with either an exam or an EMA, which would be an extended essay. So, very conventional. There had been a faculty decision that every module would include iCMAs, so we knew that we would be including an iCMA.'*

(Participant 5, Psychology)

The SCA initiated an assessment strategy based on single-component assessment, whereby a student's module grade (including pass status) can be determined solely through a straight average of all the assessment tasks within one component. That usually means exams or EMA were replaced by a continuous assessment type such as TMAs. After a few years of piloting, the adoption of SCA is made as a default approach for all level 1 and level 2 modules in 2018[2].

'Over the years, we have reduced the number of assessments and now students have 4 TMAs, which in line with the recent development at the OU (i.e., single-component assessment).'

(Participant 12, Language)

'Things to do with retention are big issues at the moment. Getting that information early and being able to respond to it is important. The problem is we've just had yet another institutional changed forced on us in that we've just gone to single component assessment module, starting in [October 2018]. we think students will add up how many marks they've got, and they will choose not to submit things when they've got accumulated their marks.'

(Participant 6, Arts 1)

To summarise it is not unusual for a learning and teaching strategy together with an Asessment policy to drive Learning Design in a well governed HE institution

Theme 2: Learning design process involved redesigning and codesigning

As part of the OU quality enhancement process, each module follows a life cycle review every 4-5 years. The purpose of the life cycle review is the review point for making a decision to end, amend, or extend the life of a module. Most module chairs indicated that their modules were not designed from scratch, and often involved redesigning an existing module or combining existing modules together. Learning materials and contents were often reused and adapted to the new module.

'The module is [MODULE CODE], kind of the third version of level 1 [subject] language and culture module, it was first produced in 1997 we was involved in the very first production of it. It was the then remade and now it's been made again but this time it wasn't just a revisioning but a full remake implementing a lot of curriculum and features.'

(Participant 12, Language)

'It was called [PREVIOUS MODULE CODE], which was a 30-credit module, and we was chairing that, and then [MODULE CODE] came up as the replacement to turn it into a 60-credit module.'

(Participant 8, Business)

In some modules, the production process was a joint effort between two module chairs. The process of co-designing a module can offer a diverse set of perspective on LD as well as distribute the responsibility and workload more equally. Participants positively acknowledged the role of co-designer (i.e., co-chair) in the LD process.

'we co-chair with [CO-CHAIR NAME] and that's been really important because having two of us working on this module closely has been really productive in terms of trying to address issues like retention, progression, and getting beyond the day-to-day issues that come up and starting to looking into the future a bit.'

(Participant 4, Education)

Theme 3: Developing study skills in learning design

The OU commits to provide equal opportunities to all students regardless of their background. Most undergraduate modules has no formal entry requirements. For this reason, the OU has an incredibly diverse population of students from different age groups with a wide variety of prior qualifications (Nguyen, Thorne, & Rienties, 2018). Some students need more support than others because they left schools, dropped out many years ago, and/or retired. This may make returning to an academic environment a daunting experience because they may lack appropriate study skills at a university level. Therefore, it is essential for LD at level 1 to build up students' academic skills in preparation for their learning journey at the OU. Most interviewed module chairs acknowledged the diversity of student profiles and the need to scaffold an inclusive LD for all.

'What we're more worried about is the larger number of students for whom they would not have been in formal education for any length of time prior to this and may not have had sufficient preparation. They need to be able to have assessment tasks that are sufficiently demanding but they're accessible and understandable.'

(Participant 4, Education)

We have students who didn't realize that engineering had any maths in it. We have those students who did and were scared of it, and still hate it. And then we have those ones who are fantastic at maths, so a bit of my role is mitigating

[2] QAC-2018-03-03 Consolidated policy for single component assessment http://css2.open.ac.uk/ecms/get.aspx?object_id=090173b4816f0ad1&format=pdf

the tensions between those three groups, because there's one group, "This is easy. we've done this before." Then you've got another group, "we don't know what to do." So, that's part of it.'

(Participant 10, Computing 1)

'what we'd been asked to do was to rewrite it in such a way that it better scaffolded students who came to the module with few or no previous educational qualifications and would, for the first bit, be more of an access course in order to sort of induct them into higher education and then take them through. So, by the end of it they were pretty much good level one students.'

(Participant 2, Health)

Most participants emphasised the need to gradually build up student study skills in parallel to subject knowledge to help them prepare for education at a university level.

'We redesigned the trajectory so that running across the entire module was a skills development strategy, in which throughout the module the students were taught how to perform a certain skill, and they had activities to perform that skill in the learning guide. So, for example, note taking, was one skill in the first block. And the other skill was paraphrasing and writing a summary. And so, students were taught to perform these skills, and then the assessment task at the end of the first block would take a piece of writing, and can you take notes from it and summarize the writing? Write it in your own words. So really, really ultra-basic, really, really simple, and what we were trying to do was build up, establish the building blocks of the components of essay writing.'

(Participant 1, Health)

'In terms of the keys things that we wanted to do, is so one thing that was really very much in the forefront of our minds was how do we prepare students for level 2 study and in particular this module was focusing on programming and problem-solving skills.'

(Participant 10, Computing 1)

Participants also underlined the importance of clarity and consistency in instructions for level 1 modules.

'And so those activities tend to follow a fairly predictable sequence, so generally speaking, we don't do a lot of mixing it up. We have a strong belief that what a student should do is, is know exactly what they're in for week by week.'

(Participant 1, Health)

'So, in terms of the design, it's making that accessible and very kind of straightforward. So, we make the tempo of the module very, very straightforward. We produced kind of readings. As in we wrote the readings, in terms of the material. And we're having an online spine.'

(Participant 8, Business)

Theme 4: Workload as a key issue in learning design

Most module chairs raised concerns about students having too much workload. The majority of OU students have a full-time or part-time job and/or caring commitments in parallel to their study. Having too many learning activities or overcomplex activities at the beginning could be very off-putting to students, who might have just returned to studying after a long time.

'There's always just, there was too much material. And the usage complexity was extremely high. So, the module would bring together several sources of information, all contained in different books. So, the student would have to buy two books, and they would also have a resource book they'd have to read in addition to learning guide, and they would also have a CD, a DVD that they would have to watch.'

(Participant 1, Health)

'There were too many questions. we mean the study skills, the, you know, reading for academic purposes or writing for academic purposes. We were asking maybe 20, 25 activities in one study week. Which again, because it was 10 hours, they're often very short activities, but students just found that overwhelming.'

(Participant 3, Education)

Keeping a balance and consistent study workload is essential to student success at level 1 modules. Many participants mentioned that they have deliberately cut down the workload and reduce the complexity of instructions when redesigning their modules.

'So that was one thing, we reduced the learning, the usage complexity, we reduced the number of activities the students had to do. So, what they did was that, before, up till that point, [MODULE CODE] had quite a frenetic pace. So, at 22

activities per learning guide, the students were always moving around doing things and shifting gears. And we think that students didn't do the activities as a result. It was just too many for them to do.'

(Participant 1, Health)

'In the first two [presentations] we wanted to do that. One question per topic, but we quickly realised that was too much, and that was producing too much stuff and too much stress for both student and tutor. So, we actually changed that within first presentation.'

(Participant 9, Science)

Participants also proactively estimated study workload of their learning materials and keep it consistent throughout the weeks.

'We are very much encouraged to have the same workload each week, and we think that's what we have always done and are trying to do. It's useful to get advice sometimes in the middle of writing module. In our early draft, we try to put timing against everything. A while ago we even published this to students. This would take you so long etc. We kind move away from that because we know that some students take this much time and others take this much time so there are lot of variations. We also have developmental testing, a small chunk of study materials, and the testers say how long it took them. In early draft, we will put timing against activities, and the author brief would be to make the week exactly to that length.'

(Participant 12, Language)

Theme 5: Learning design varied across modules and disciplines

Module chairs indicated a wide range of learning activities were used in their module depending on the discipline and the content. For some modules, the learning pattern is relatively traditional. A typical week of learning activities often includes readings, listening, watching and activities that help student reflect on the learning materials.

'So generally, a week of learning would start off with some kind of activity which is designed to sensitize a student to a topic area, to place the topic area at the student's fingertips… and then there will activities that will involve some kind of assimilative work in which we explain an idea or a theory or body of knowledge, so an expository activity. And those expository activities could be asking them to go and do a bit of reading, or to go off and look at a piece of, find some reading on something. And then the flow will lead towards so sort of application type activity in which we would ask them to watch a, look at a case study and understand, apply a theory they've just read about to that piece of, to that case study.'

(Participant 1, Health)

'Quite a lot of reflection, quite a lot of, common jamming some ways, you know, old school, old style, you activities of, you know, here's a [inaudible 00:09:02], here's an idea from the reader chapter, what's your response to it? Typing into a free text box. And then when they'd type that up, then comments to the module team had written would come up below that.'

(Participant 3, Education)

Interestingly, the excerpts from the module chairs in Health and Education modules aligned with the quantitative figures shown in Figure 23. Both modules used a lot of productive activities (32% for Education, and 24% for Health). To put it in perspective, the average percentage of productive activities of 37 modules in RQ1 was 17.6% with a standard deviation of 12.4%. That means, the Education and Health modules reported here had 0.8 to 1.2 standard deviation higher in productive activities than the average.

In other modules, instructors made use of interactive activities, case studies, brainstorming, or quizzes. The excerpt from the module chair in Business module also aligned with Figure 23, which showed that the Business module had the highest percentage of interactive activities (3%) compared to the average of 2.2% in interactive activitites reported in RQ1.

'It's varieties. It's quizzes, a little bit of analysing new responses to quizzes, it's case studies, it's tutor group forum discussions. We also have one case study, which we filmed in Germany, which runs through that whole module. We've got a narrative. So, we say, okay, we've got a business here that students can look at, because it's kind of theme-based.... And what we thought, it'd be nice to have this case study that we keep on returning to.'

(Participant 8, Business)

'We always start with something active, so we wouldn't start with giving information. It would always start with activating prior knowledge or bringing in their own experience. For example, we might ask students to have a quick brainstorm, or what they already know about the topic, or engage them in a mini interview. Then we would be very keen to make it clear to students how their learning is accumulated, so based on something they have learnt in previously.'

(Participant 12, Language)

Collaborative activities remain a challenge for most participants in their LD. While collaborative activities were perceived to be useful for student learning, they were not well received by students because of concerns about their grades depending on others.

'we think there is a problem about students taking up the opportunities to be doing things together online. Students don't seem to like very much the collaborative research work that they would routinely do somewhere else, particularly if they are concerned that their grade depends upon other people in their group performing.'
(Participant 5, Psychology)
'

One participant also mentioned the resistance from tutors when they introduce collaborative activities. Interestingly, this finding also matched with Figure 23, which showed that there were no communication activities in the Health module.

'Yeah. It's missing because we took it out, and we took it out consciously. So, in the 2005/2006 version of [MODULE CODE] there was a collaborative activity that was regarded as disastrous by tutors, and by the module lead. And because we worked with tutors when putting together [MODULE CODE], that was one piece of advice we did listen to. And we removed it, and we never put any other genuinely piece of collaborative activity in the module... we was aware that the organization of collaborative work was always problematic because tutors never quite knew who was still registered in the module when it came to organize collaborative activity and assigning people. In the early days, 50%, sometimes up to 56% of the students would drop out of the module before the end. And so, if you're trying to organize collaborative activities when half your student body has left, it was really, really difficult for the tutors.'
(Participant 1, Health)

Other participants acknowledged the importance of collaborative activities in LD. However, they expressed that collaboration in distance learning is challenging and there are a lot of work to be done to get it right.

'we don't quite think we got collaboration right. Collaboration between students in online environment, it's very difficult…They [students] just require to interact with each other. Just like discuss things on forums and things like that. And it's just the nature of OU students, we mean we have a lot of students who choose to study with the OU, so they don't have to go to a university and, you know, meet and even look at other people. And so, a lot of them are very adverse to just interacting. And they actually felt that they chose this degree, so they didn't have to. And so, for a lot of them, just ordinary communication is quite stressful. So, it's difficult because it's a requirement for progression in any scientific discipline ... Well in life, to be honest. But in any scientific discipline you have to work with other people. So, it's a learning outcome we can't really remove.'
(Participant 9, Science)

In summary, the LD process undertaken by module teams was influenced by such factors as institutional policies, student profiles, and co-designing/re-designing activities. OU module chairs scaffolded learning activities to increase the study skills of their students in line with the designated Learning Outcomes for each module, while making sure there was a balanced and consistent workload. There was a wide range of pedagogy used across modules and disciplines. Nonetheless, most instructors reported challenges in embedding collaborative activities into the curriculum due to the negative feedback from students and tutors.

4. Discussion

This study explored how and why instructors design for learning in an online and distance setting by employing a mixed-method approach, which combined learning analytics visualisations and network analyses of 10 learning designs at the Open University UK (OU) with subsequent semi-structured interviews of 12 instructors to unpack how and why teachers made these respective learning design decisions. In terms of RQ1, the use of SNA learning analytics techniques on learning artefacts highlighted several common but also unique connections between different types of learning activities in learning designs. We observed common patterns, such as the predominant use of assimilative and productive activities, and yet diverse variations in assessment strategies in different courses. We illustrated how learning analytics approaches like SNA can help us identify some of these common design patterns across a large number of courses, which could serve an important role in curriculum management. At the same time, using this LA approach we were able to conclude that many instructors (i.e., module chairs) seem to make several common and conscious learning design decisions, such as for example to reduce other activities in a week when assessment activities are scheduled.

While the recorded learning design decisions in OULDI provide an important proxy of a learning design in a respective module on a week-by-week basis, some of the underlying reasons why instructors might have designed a particular combination of learning activities may not be apparent using solely the SNA approach. Therefore, in RQ2 we specifically explored how and why 12 instructors made these design decisions, whereby we uncovered important nuances which are hidden from the quantification of learning artefacts.

We found five main themes emerging from the triangulation of data. Firstly, instructors emphasised the importance of building up student study skills at level 1 modules in parallel with subject knowledge. The OU offers a rich set of resources to develop study skills such as how to write an essay, how to find information, how to revise for exams, and computer skills[3]. These study skills are crucial to the development of OU students in general, but even more so with students who lack academic skills or have not been in an academic environment for a long time. For example, in a large-scale analysis of 123,916 undergraduate OU students in 205 modules from 2015 to 2017, Nguyen, Thorne, et al. (2018) showed that students with no formal qualifications or less than A-levels were 37%-50% less likely to pass a module than students with A-levels. Clearly, the prior educational background had a strong effect on the academic performance of OU students. Therefore, it is important to equip students with the necessary study skills to succeed in a distance education setting.

Secondly, student workload was another central aspect of LD at the OU (Chambers, 1992; Whitelock, Thorpe, & Galley, 2015). Module chairs in this interview study have highlighted potential problems of having excessive study workload or over-complex instructions on level 1 students. This finding was supported by RQ1 which showed a large variation in workload both within a module and between modules (Nguyen, Rienties, & Toetenel, 2017). To overcome this issue, module chairs reduced the number of learning activities, removed non-essential content, and kept the instructions straight forward and consistent throughout the module.

Thirdly, assessment design has been a core aspect of OU retention strategies which had a wider impact on LD decisions at level 1 modules. Participants mentioned that their assessment design was driven by the changes in OU's policy which made a single component assessment (SCA) a default approach since 2018[4]. The premise of SCA is that students should be assessed in a consistent manner, either through continuous assessments or exams. As a result, most modules decided to remove the exam or EMA and replaced them with a TMA. The switch to an SCA strategy has been well received by the module team because it seemed to improve the retention rate as it is a strong motivator for students to show what they know as to what they can only remember.

Fourthly, this study also revealed two unique aspects that are the by-products of the complex module production process at the OU namely co-designing and re-designing. The OULDI process is often different from a traditional university, where a professor/lecturer usually has full autonomy over the design process and the course content. However, module materials at the OU have to undergo a peer-review process by multiple stakeholders before they are officially used in the LD. Because of this long and complex quality assurance process, module materials were often reused until the new module cycle review comes in every 4 to 5 years. On the one hand, this process ensures the quality and consistency of the learning materials, which is beneficial to OU students. On the other hand, the rigidity of this process raised a question to what extent the OU module materials are up-to-date or can be updated without significant barriers from the quality assurance process. At the same time, because of this complex module production process, the OU module team is often made up of two or more academics. This co-design process was perceived to be useful by the participants because it offered new perspectives on LD, and progression and retention issues. For some large modules with thousands of students and hundreds of tutors, having more than one module chair means that the responsibility and workload can be shared amongst team members. However, this codesign process perhaps did not occur 'naturally' but as a combined result of the complex LD process and pressure for accountability from the management.

In terms of the pedagogy used in LD, there was a wide range of learning activities adopted by module chairs across different modules. In line with findings from RQ1, most participants mentioned the use of assimilative activities such as readings, listening, watching and productive activities such as analysing, reflecting, criticising. In some STEM modules, there were more interactive and experiential activities as the module chairs strongly believed in learning by doing/practising. Collaborative activities were perceived as important but challenging by most participants. Module chairs mentioned the resistance from students taking part in collaborative activities because the dependencies in grading and the resistance from tutors (ALs) to manage group works which can be time-consuming. This was again reflected in RQ1, which indicated only a small proportion of LD was dedicated to communication and collaborative activities. This is in sharp contrast to findings from Rienties and Toetenel (2016), who found that the primary predictor for student retention was communication activities. In other words, what students might enjoy and what is good for them might not be related.

This finding was supported by prior research in collaborative learning and online collaboration (Cherney, Fetherston, & Johnsen, 2017; Kreijns, Kirschner, & Jochems, 2003). Some students may be entrenched with passive learning strategies and exhibit strong levels of resistance when they are asked to collaborate with each other. There are many explanations for this such as miscommunication (Kreijns et al., 2003), accountability problems (Cherney et al., 2017), and cultural differences (Mittelmeier, Rienties, Tempelaar, & Whitelock, 2018). In online and distance learning setting such as the OU, the challenges for collaborative learning is even more salient because the students are complete often strangers coming from different background, age groups, communicating through asynchronous channels such as a VLE (Thorpe, 2002). Simply

[3] http://www2.open.ac.uk/students/skillsforstudy/

[4] https://help.open.ac.uk/documents/policies/assessment-handbook

creating a medium for communication (e.g., opening an online discussion forum for a group of students) will not guarantee an effective collaboration experience. There are multiple factors such as group cohesion, trust, sense of community, and culture that should be considered (Kreijns et al., 2003).

An obvious limitation of this study is the specific context in which this study was conducted, which might limit generalisation in other settings. Furthermore, as highlighted elsewhere in this special issue, there are several other conceptualisations of learning design approaches that could potentially highlight a more nuanced understanding of the interaction between learning design and learning analytics.While the OULDI approach has proven to be useful for many instructors due to its relative simple seven categories, and has proven to be a very good and solid predictor of actual student engagement (Nguyen, Rienties, Toetenel, Ferguson, & Whitelock, 2017), learning design decisions are often multi-level in nature, and strongly embedded in more complex sets of decisions about learning outcome goals, task sequences, and feedback. Therefore, we strongly encourage other researchers to explore whether using similar SNA learning analytics approaches in their contexts might provide comparable or contrasting insights.

5. Conclusion

In conclusion, this study investigated how instructor designed for learning in online and distance education by employing a mixed-method of network analysis with semi-structured interviews of 12 module chairs in 10 modules. We showcased the learnng analytics application of network analysis for standardized comparisons of various learning designs. In most modules, the triadic combination of assimilative, productive, and assesmsent activities remained the dominant repertoire of practice. However, communication and experiential learning activities only had a limited presence in most learning designs. Through such process, we identified common design patterns and variations between courses, which can be integrated as part of institutional curriculum management.

However, we also underlined the importance of going beyond the quantification of learning artefacts. Our interviews revealed a strong influence of management and institutional policy on teachers' design decision. Building up study skills and maintaining a balance of workload were considered as the main priorities of learning design. Interestingly, while instructors saw the value of communication and collaborative learning activities, they were put off by the resistance from both students and tutors. Hence, the final product of learning design lacks communication activities.

In going forwards, we encourage institutions to utilize the power of learning analytics to make existing teaching practices more explicit, which can then be compared, analyzed, and linked to academic outcomes and learning processes. We also emphasize the need to actively gather instructors "voices", and engage them in the development of learning analytics for learning design.

Declaration of Conflicting Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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